Spending Instructional Time Wisely: A Case Study Using Brief Intervention Probes to Determine the Most Effective Strategy

Laura Baylot Casey

The University of Memphis

Janna Siegel Robertson

University of North Carolina, Wilmington

Robert L. Williamson

The University of Memphis

Constance Serio

Gilbert Public Schools

Susan Elswick

Memphis City Schools

Abstract

Single case studies are helpful in analyzing the details of implementation of an individualized intervention program. Their exploratory nature can result in more case studies, which can be compared to allow for better understanding of an intervention's usefulness. This case study investigated the effectiveness of using brief intervention probes for two different evidence-based interventions to identify the most effective teaching strategy for a struggling elementary school reader. Following initial grade level placement, two intervention probes were tested by rapidly switching between them, then analyzing the data. The intervention that yielded the most gains in words correctly read (WCPM) was selected and implemented to increase the likelihood for success. Results were promising as WCPM increased by 37 words from baseline to intervention. The study provides a glimpse into a much-needed area of research regarding using brief intervention probes to determine the most effective specific interventions prior to implementation. This research provides recommendations for use within any intervention model, especially Response to Intervention.

Résumé

Les études de cas unique sont utiles pour analyser les détails de la mise en œuvre d'un programme d'intervention individualisé. Leur nature exploratoire peut amener à d'autre études de cas, qui peuvent être comparées et permettre une meilleure compréhension de l'utilité d'une intervention.Cette étude de cas s'est penchée sur l'efficacité de l'utilisation de brèves enquêtes d'intervention pour deux différentes interventions factuelles afin d'identifier la stratégie d'enseignement la plus efficace pour un élève d'école élémentaire ayant des difficultés en lecture. Après le placement initial par niveau, deux enquêtes d'intervention ont été testées en passant rapidement de l'une à l'autre, puis en analysant les données. L'intervention qui a abouti à l'augmentation la plus significative concernant le nombre de mots lus correctement (MCPM) a été sélectionnée et mise en pratique pour augmenter les chances de réussite. Les résultats ont été prometteurs puisque les MCPM ont augmenté de 37 mots entre le point de départ et l'intervention. L'étude fournit un aperçu sur un champs de recherche qui s'impose concernant l'utilisation de brèves enquêtes d'intervention pour déterminer les interventions spécifiques les plus efficaces avant leur mise en œuvre. Cette recherche a des implications durables au sein de n'importe quel modèle d'intervention, en particulier « réponse à l'intervention ».

Spending Instructional Time Wisely: A Case Study Using Brief Diagnostic Probes to Determine the Most Effective Reading Fluency Strategy

Response to Intervention (RtI) has been adopted by school districts across the United States of America. RtI is an academic model that encourages practitioners to move away from the discrepancy model previously used to diagnose and qualify a student for special education (Education for All Handicapped Children Act, 1975) and focus more on utilizing evidence-based interventions throughout the school to assist in the documentation of an educational need evidenced from a lack of response by the student to a high quality intervention (Shinn, 2007). Four criteria must be present to ensure proper implementation of RtI. The criteria include: (a) use of a multi-tiered system for academic and social intervention; (b) all interventions must be evidence-based; (c) there must be a routine, systematic monitoring system; and (d) there must be a data-based decision-making system (Batsche, Elliot, Graden, Grimes, Kovaleski, & Prasse, 2006).

The RtI multi-tiered approach includes three distinctive tiers that involve different levels of intensity, in terms of academic interventions, within each tier. Tier 1 is often referred to as quality universal interventions for all and typically meets the needs of approximately 70-80% of the students in the general education classroom, thus leaving 20-30% needing additional instruction or intervention at the next level, Tier 2 (Vaughn, Wanzek, Woodruff, & Linan-Thompson, 2007). Tier 2 interventions are often small group interventions where the students are placed based on abilities. The Tier 2 student will move to Tier 3 status if the interventions in Tier 2 are unsuccessful in remediating the area of need. Tier 3 represents the most intensive set of services provided to the student. Tier 3 interventions — including individualized academic interventions — are designed to directly impact the needs of the struggling student while the student continues Tier 1 and Tier 2 level supports and interventions. Thus, the way the RtI approach is designed, an individual in Tier 3 would not be denied Tier 1 and Tier 2 services. However, within this model there is no protocol for how the teacher selects the evidence-based intervention at the third tier, the intervention is only required to match the academic area in need of remediation (e.g., an evidence-based reading intervention is selected for a struggling reader). The problem arises in the classroom when the teacher selects a method from a list of research-based interventions on notable sites such as National Reading Panel, the United States Department of Education Institute of Education Sciences' "What Works Clearinghouse" website (U. S. Department of Education Institute of Education Sciences National Center for Education Evaluation and Regional Assistance, 2003), or the CBM warehouse (Wright, 2003) but does not test the interventions out on individual children to determine if the intervention is appropriate for them. In other words, a one-size fits all approach does not work even when the interventions being selected are evidence-based. Thus, the remainder of the paper will describe the role of assessment in the RtI model, Curriculum-based measurement and RtI; the value of using interventions probes prior to selecting an intervention in Tier 3; provide the reader with step-by-step instructions for implementing probes; provide an example case study to highlight the successes found with probing before beginning individualized instruction; and end with steps for conducting probes in the classroom.

Assessment and RtI

When children struggle with academics at any level, intervention should be early and appropriately matched to the skill deficits. Using assessment to foster effective instruction is

hardly new. For years, curriculum based assessment (CBA) and diagnostic-prescriptive techniques have been advocated for students with special needs (Fox et al., 2009). These effective assessment procedures were meant to identify the skills and knowledge the student possesses before instruction begins, and continually measure a student's progress. Unfortunately, these procedures do not test which evidence-based intervention would be best to use with a particular student. Thus, rather than employing educational "trial and error," the present manuscript proposes using brief intervention probes to assess which intervention works before committing time and energy on the part of the teacher and the student.

While probing is not specifically delineated in the RtI model, it should be seen as best practice to test out an intervention prior to implementing and leaving a student in the "intervention" phase for up to 12 weeks (National Center for Response to Intervention, 2010). Many school districts utilizing the RtI model have adopted curriculum-based measurement (CBM) assessment protocol as their primary tool for establishing normative data, identifying placement, and monitoring progress (Deno, 1985). As it relates to the RtI model, CBM are used to determine what tiered intervention a student should be receiving. Elliot (2006) noted that for a student who has been identified as needing more intensive interventions, Tier 2 or 3 students should not stay within that tier for more than a grading period. However, because of the flexibility of the grading periods employed by each school, this time frame will vary from district to district (nine week block scheduling, six week standard grading period, and year round schools). Ultimately prolonging the intervention for more than a grading period could be detrimental to the learner and his or her academic progress. For example, if the intervention is not successful, then extending the time in intervention is not helpful to the student or the school; if the intervention is successful, then the goal should be to quickly move the student back to previous tier. Even for countries or locations not using RtI, the same arguments can be made about using time efficiently and not spending time and money on ineffective interventions. Evidence-based practice needs to focus not just on what works globally, but also on what works for the individual student.

Intervention Probes

CBM uses intervention probes to determine student progress. Probes are standardized teaching segments that last usually 1-5 minutes (Wright, 2003). Since the probes are efficient, they can be done repeated times to collect data on a student's progress. A brief intervention probe can serve many functions. For example, one purpose for using a brief intervention probe is to identify simpler and more efficient interventions (Gortmaker, Daly, McCurdy, Persampieri, & Hergenrader, 2007); another is to eliminate ineffective interventions. In recent studies aimed at improving academic skills, a brief experimental analysis has been used in the early stages of the intervention phase to "test out" interventions for improving the participants' academic deficits (Daly, Martens, Dool, & Hintze, 1998; Daly, Martens, Hamler, Dool, & Eckert, 1999; Daly, Murdock, Lillenstein, Webber, & Lentz, 2002; Daly, Shroder, & Robinson, 2002; Eckert, Ardoin, Daly, & Martens, 2002).

Utilizing Intervention Probes

Utilizing the probe process in the classroom can be easily accomplished. For teachers and clinicians, one of the first steps in using intervention probes is to collect baseline data on student performance. Once this is done, the teacher should then implement at least one brief intervention probe (Noell, Freeland, Witt, & Gansle, 2001). The next step is to compare the

results of the intervention to that of the baseline data in order to determine whether a meaningful change has occurred for the participant. Following the comparison of the first evidence-based intervention to that of baseline data, a second evidence-based intervention should be probed. This data should be compared to baseline as well as the first intervention. Comparison of the data from the intervention probes to baseline should consist of looking for positive gains from the student in terms of the data having an upward trend from baseline. Comparison between interventions should consist of looking for large separation between the data points of intervention one and intervention two. If the data are separated between the two interventions and positive gains have been achieved from baseline, then one intervention is all that is needed. If the data points do not have much separation or are overlapping, then additional probes are needed.

Purpose of the Case Study

        This case example focuses on the importance of determining the most effective Tier 3 intervention, prior to implementation, to ensure effective outcomes, to decrease the time needed for student remediation in Tier 3, and to decrease the need for extended Tier 3 services. In the current example, two interventions were selected to be probed following the attainment of Lisa's current reading level (e.g., baseline). The two evidence-based interventions that were chosen were *repeated reading* and *listening passage previewing* (National Reading Panel, 2000). Both of these interventions were selected from interventions that had been proven to be successful in increasing oral reading fluency, were noted as effective evidence-based interventions, and were aligned with CBM. Each intervention was examined separately during the experimental probing phase to determine which intervention provided the learner with the most successful outcomes. The primary research question was: "Would a brief intervention probe, consisting of two interventions with one reading probe each, be enough to identify the more efficient intervention and/or be able to eliminate the ineffective intervention based on the individual's words correctly read per minute (WCPM)?" (Gortmaker, Daly, McCurdy, Persampieri, & Hergenrader, 2007). In order to measure WCPM and use data to make instructional decisions, CBM protocol for scoring oral reading fluency probes was utilized throughout the case study.

Case Study

        Lisa, an eight-year-old female, was referred by her parents due to academic difficulties in reading fluency. At the time of the study, she was diagnosed with Attention Deficit/Hyperactivity Disorder (ADHD), Predominantly Inattentive Type, as well as an auditory and visual processing disorder. Visual and auditory processing are the processes of recognizing and interpreting information taken in through the senses of sight and hearing; difficulties with interpreting auditory or visual information both impact the ability to read fluently (National Center for Learning Disabilities, 2009). Lisa attended a local school and received all instruction in a regular education classroom. She was not receiving any outside tutoring at the time of the study, but prior to coming to the clinic she received six weeks of small group (3:1) tutoring after school to improve her reading skills. Lisa's parents revealed during the interview that Lisa had not made gains from the small group tutoring sessions as she was still unable to read at grade level.

Materials

Baseline and progress-recording reading passages from the pre-primer and first-grade levels were selected for the initial placement assessment. The reading CBM probes were adapted from the AIMS Web Curriculum-Based Measurement progress monitoring system (Pearson, 2008). Subsequently, based on the data, she was reading at the pre-primer level and thus the pre-primer level was used during the intervention. Passages were each 100 words in length. One passage was typed for the participant and one passage was prepared for the scorer with a running count of words and space to mark corrections, omissions, and deletions consistent with CBM scoring (Shapiro, 2004).

Probed Interventions

The two interventions being observed for effectiveness through the probe process within this research include both repeated reading and read aloud/ listening to a passage.

Repeated Reading. According to Therrien (2004), "Repeated reading is an evidence-based strategy designed to increase reading fluency" (p. 252) with the end goal for the participant being the ability to read fast and effortlessly (Carnine, Silbert, Kame'enui, & Tarver, 2004). Repeated reading (RR) consists of giving students short 100-to-200 word passages written at his/her instructional level as determined during a baseline session prior to intervention. During a repeated reading, the child repeatedly reads the same passage for one minute from the beginning each time until the passage has been read a predetermined number of times or until predetermined level of fluency is attained. For the purposes of this case study, Lisa read the same passage three times. The decision to have her read three times is from the work of Therrien's (2004) reviews that found that three to four readings were optimal and that more than this does not result in significantly more gains. When the passage had been read for a total of three times, the student began a new passage at the same reading level (Masteroperi, Leinart, & Scruggs, 1999; see procedures section for more details on implementation). Once the student correctly reads a specific number of words per minute indicating that he/she has reached mastery level for that reading level, the student then begins reading passages at a higher reading level and the repeated reading intervention is continued until grade level is attained. The repeated reading intervention is commonly used by school districts due to its ease of implementation and evidence-based research to support its use

Listening Passage Preview. Listening passage previewing (LPP) consists of the child listening to a passage prior to orally reading the passage for time and accuracy. Thus, the same passage is used in the preview and the oral timed read. LPP consists of giving students short 100-to-200 word passages written at his/her instructional level, having the student listen to the passage, and then having student read it orally for one minute. LPP can be done by having an adult, peer, or more experienced reader read the passage aloud as the participant, or less experienced reader, follows along word for word for his or her finger. Following along with a finger is used an indication that the student is actually following along in the text (Daly & Martens, 1994). This technique can also be done by pre-recording the passage as it was read aloud and then replaying it for the learner as he or she follows along with the tape recorder. Following the preview reading, the student then reads the passage aloud for one minute. Specifically, this study modeled the correct reading of the passage by the researcher to Lisa in real time, followed by the timed reading of the passage by her. During the timed reading, the passage was scored for accuracy.

Dependent Variable

The dependent variable was the number of words read correctly per minute *(*WCPM). WCPM were calculated for each reading during a repeated reading session. WCPM were calculated as total number of words that the participant pronounced correctly within 3 seconds. Words that were not scored as correct were those words that the participant failed to read correctly within 3 seconds, mispronounced, omitted, and/or made word substitutions (Shapiro, 2004). Thus, the calculation was total words read minus errors equaled WCPM.

Data Collection

As Lisa read aloud, the interventionist recorded both words read correctly and errors on the examiners copy of the passage selected. Errors were marked with a dash drawn trough the word and a line was drawn after the last word read at the end of one minute to ensure proper counting of total words read. Words were only scored if read during the one-minute timing. Words not read by the participant were not calculated in the final count. For each repeated reading session, three readings took place using the same passage; however, only the median score for each session was recorded and graphed for the participant. The median score was utilized during baseline, the probing of the interventions, and all treatment sessions during the intervention phase. The median score was selected based on limitations and suggestions provided from previous research. For example, when reporting WCPM, some researchers utilized the first reading to ensure that a practice effect had not taken place and other researchers used the final reading of the three readings so that the highest gains made by the participant were reflected (Eckert, Ardoin, Daly, & Martens, 2002). Both of these selections, using the first and the third reading, had limitations. For example, using the final reading was not a good indication of generalized gains, but rather an in-session gain; and using the first reading was more an indication of generalized gains, but was viewed as not the best indicator of within-session gains. Therefore, the median was selected for the purposes of this study.

Design and Rationale

We chose to conduct a case study because we were examining whether using probes in an educational setting was a practical and effective technique for determining the most effective intervention for individual children. Because a case study was conducted, single case research design was employed to evaluate the changes from baseline to intervention. Single case design has a history of being an acceptable and common research design for examining issues in special education (Horner, et. al, 2005). One reason for the success of single case design in special education is that children with special needs are unique and their learning needs have not been easy to compare to those of other children. A second reason for the success of single case design is that it allows the teacher or researcher to measure the true impact of the intervention for the individual child, as the child serves as his or her own control (Riley-Tillman & Burns, 2009). Though this method has strength in terms of demonstrating effectiveness on a case-by-case basis, it does have limitations for generalizability which will be discussed more in the limitations section. However, a successful case study can give a clear illustration of how the probes impacted an individual student and can also demonstrate the potential for effectiveness within a Tier 3 individualized intervention.

The design employed was an A/B single-subject research design with embedded intervention probes presented in an alternating treatment fashion following the baseline phase. This design allowed for the collection of baseline data, a brief comparison of the two selected

interventions, and the implementation of the selected intervention. An A/B design was selected because the desired outcome was to evaluate changes from baseline to intervention using a design that would be easily replicated in the classroom setting. This design also allowed for the visual comparison of level, variability, and trend in data points both across and between sessions and from the baseline to the intervention phase.

Procedures of the Case Study

Baseline

During baseline there was no instruction provided as the participant read aloud selected passages. The baseline reading passages were originally taken from Grade 1 material and subsequently from pre-primer material based on the data obtained from the Grade 1 passages, in order to more closely approximate the student's instructional level of 40-60 WCPM (Fuchs & Deno, 1982). Data were scored using curriculum-based assessment protocol for WCPM and the median score was reported.

Brief Probing

Following the collection of baseline data to obtain Lisa's grade level, probing was performed utilizing two different interventions designed to improve oral reading fluency (National Reading Panel, 2002). The two interventions selected were *listening passage previewing* and *repeated reading*. The interventions were probed during one trial using two different reading passage each written at the pre-primer reading level. Thus, one probe for each intervention was conducted until a large separation was visually observed between the two interventions (Noell, Freeland, Witt, & Gansle, 2001). In this case, just one probe for each intervention was needed to see the degree of separation between data points or the largest treatment effects based on number of words read per minute by the participant. A different reading passage was selected for each intervention to control for interaction effects between the two interventions and practice effects during the probing.

Intervention

Repeated reading was selected for the intervention based on the separation of data from the brief probing conducted following the baseline. Repeated reading is described above in an earlier passage. During this case study, Lisa read the same passage for one minute, three times before another passage was utilized (Therrien, 2004). When the passage had been read for a total of three times, she began a new passage at the same reading level (Masteroperi, Leinart, & Scruggs, 1999). The median score from the three readings was recorded as the number of WCPM read during that session.

Results

All of the results can be found in the figure below, which displays Lisa's WCPM data collected during baseline, the probing, and the treatment condition utilizing a repeated reading intervention. During baseline, Lisa demonstrated reading skills at the frustration level (< 40 WCPM) while reading Grade 1 reading passages (M = 13.3 WCPM) and close to an instructional level (40- 60 WCPM) for the pre-primer reading materials (M= 37 WCPM). Thus, pre-primer material was used during the probes and the intervention phase.

The brief probe for the comparison of interventions, yielded promising results as Lisa read 9 WCPM utilizing the listening passage preview intervention and 54 WCPM with the repeated reading intervention. This large amount of separation provided the much needed evidence to select and proceed with the repeated readings intervention.

The intervention phase began with Lisa reading 38 WCPM and ended with Lisa increasing to 75 WCPM. Thus, from baseline to the completion of the intervention, data collected on WCPM increased by a total of 37 words. In fact, based on Lisa's final data, she would be able to proceed from the pre-primer reading level to the first grade level as she read greater than 60 WCPM at the last data point collected (Fuchs & Deno, 1982).

Figure 1.

The graph depicts Lisa's progress across phases (baseline, probing, and intervention).
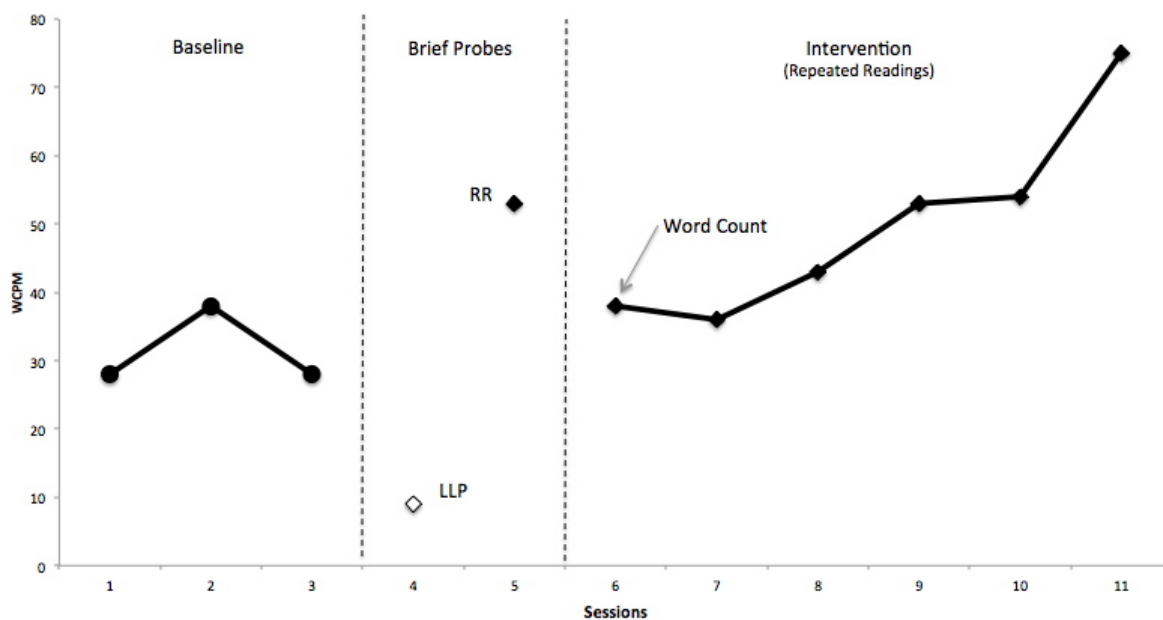
Treatment Integrity

The independent observer also assessed treatment integrity during 80% of the treatment conditions using a checklist. The checklist was based on the protocol established for conducting repeated reading and was outlined in a step-by-step sequence for the observer to record each step. For each session, the observer recorded whether the interventionist completed the step. The average correct for appropriately implementing conditions was 98% (range, 97% to 100%).

Discussion

Because of Lisa's diagnoses, this was a unique case, but an excellent example of how using brief intervention probes can assist in the selection of an effective intervention for individual student's needs. The first struggle, unique to this case, was that the participant's diagnoses of both visual and auditory processing disorders. This challenge was magnified when the selection of interventions was being discussed and the fact that the two types of interventions put forth by the National Reading Panel for effectively increasing fluency involve repeated

viewings of a passage (visual) and a listening previewing of the passage (auditory). Thus, both interventions supported in the research could have proven problematic based on the nature of these disabilities. While this presented a concern, it also a presented a prime opportunity to utilize brief probes so that no time was wasted on an ineffective intervention.

The ultimate goal of this study was to examine the efficacy of using brief intervention probes to select an appropriate reading intervention for a young girl struggling with fluency who carries two diagnoses that greatly inhibit her reading ability. The probing phase was especially brief in this investigation, with only one reading probe for each intervention tested. Only one probe was used to better replicate the time constraints in the classroom, to determine how brief this phase could be and still produce meaningful results. The use of probes, in the current study, did provide the empirical support needed to select the repeated reading intervention. It also proved to be a quick comparison that yielded profound results for the struggling reader. Thus, the case study confirmed previous findings for the use of brief probes prior to intervention (Noell, Freeland, Witt, & Gansle, 2001) and actually improved on the previous findings by illustrating that in some cases, like Lisa's, only one probe can be enough to make classroom instructional decisions. The current study also highlights the fact that a complicated research design was not needed to show meaningful change or confirm academic gains with a student. This research will pave the way for teachers, specialists, and psychologists to utilize brief probes prior to implementing an intervention in the classroom for a struggling reader.

Practical Implications from the Case

Probing procedures are easily incorporated into the daily class schedule and are similar in nature to the concept of differentiated instruction. A teacher's day when utilizing a probe procedure would look similar to the following: (a) collecting baseline data on the student in the academic area in need of further instruction; (b) pulling the student aside and quickly alternating between two evidence-based interventions aligned with CBM, which can be found at www.interventioncentral.com; (c) scoring the probes and comparing the scores to both baseline and each other; and (d) analyzing the scores for evidence of academic growth. Following these steps, the teacher would either re-administer the probes until the data clearly separate from each other and notably improve from baseline, or begin the probing procedure again utilizing different interventions until gains are made. In conclusion, identifying the most effective intervention prior to implementation will save the teacher time in determining the best intervention for the individual student, save the student time that could possibly be wasted in a Tier 3 intervention that was found to be less effective or not effective, and save a student from an unnecessary referral to special education.

Limitations

The main limitation of only using one probe of each intervention proved to actually be the best indicator that this case study could have profound implications for the classroom, especially at the level of individual children. In the current study, using one probe was not problematic as the difference in the effect observed for each intervention was of such a magnitude that a second probe was not needed (e.g., 9 WCPM versus 55 WCPM). There is a chance that Lisa would have varied in her WCPM for each of the interventions if given a second probe, thus making the findings less profound, but it is doubtful since at the end of the two week repeated reading intervention, she did reach mastery reading level and actually gained a grade level in terms of WCPM. This use of one probe also proved to be an asset as this will save

school districts funds that would be otherwise ill-spent due to employing less effective interventions that require more time before observing academic progress. The use of an A/B design is also a limitation in terms of lack of experimental control, as it does not account for any threats to internal validity. However, in the classroom, this design is the most easily implemented and replicated by teachers. This design makes the most practical sense as skill acquisition is attained; there is no attempt to reverse it for the sake of research.

Future Research

As the role of using brief intervention probes in accordance with RtI is better researched and more studies are disseminated demonstrating its effectiveness, this case study will be better understood and its methods have great potential to be used in schools across the nation. Future research in the area of the number of probes used and the number of interventions selected for the analysis would be helpful and make this process more standardized for teachers and professionals working with students in the classroom. Standardization in schools is critical due to the amount of time that is needed to be devoted to full classrooms and small group instruction and the lack of time available to spend on implementing an ineffective intervention for the student needing a Tier 3 strategy. This study also highlights the need for teachers to be aware of and ready to implement reliable evidence-based practices in the classroom so that the selection of intervention probes comes naturally to general educators. Increasing teacher awareness may come in the form of teacher training directly related to evidence-based practices across subject areas and/or access to online resources. Future research should investigate teacher and school districts' preferences to determine the most appropriate means of exposure to evidence-based practices within an RtI model. Lastly, research needs to be conducted in the area of probing interventions with a larger number of participants. However, there is a relevant strength in conducting a pilot study or a preliminary analysis with one individual prior to a larger study. Hackshaw (2008) stated that many times it is better to initially test new research hypotheses in a small number of participants so as to avoid spending too many resources, (i.e., subjects, time, and cost) in an area that may not yield promising results.

Conclusion

Many benefits are associated with using brief intervention probes prior to implementing an intervention as to whether the school should use RtI or not. These benefits include the ease with which an effective intervention is determined by rapidly switching between two evidence-based interventions, the reliance on objective data as opposed to subjective opinions, and less time in remediation for the student. While a decreased amount of time spent in the intervention phase waiting for the student to make gains and an increase in the use of objective data-based decision-making in the classroom are important, the true benefits extend beyond the ease and the limited time required. The true benefits are seen by the struggling students achieving academic levels that they previously would not have achieved. This ultimate benefit of academic gains made by students in less time is profound for the classroom in terms of teachers' time, academic success, reintegration of the student back into general education (Tier 1), and less unnecessary referrals for standardized testing. The true power of utilizing intervention probes within the RtI framework is limitless and the authors strongly recommend the practice to become standard in the years to come.

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